Fabulous Favorites-Fun with Bar Graphs

Brief Overview:

Display of data is an essential part of statistics because when information is displayed in graph form, it is easier to read and interpret. Through data collection, students will collect, organize, display, analyze, or interpret data to make decisions, predictions and make comparisons. During this unit, students will have the opportunity to create, read, interpret and identify the parts of bar graphs.

NCTM Content Standard/National Science Education Standard:

1. **Formulate questions that can be addressed with data and collect, organize, and display relevant data to answer them**
   - **Collect data using observations, surveys and experiments;**
   - **Represent data using tables and graphs such as line plots, bar graphs, and line graphs;**

Grade/Level:

Grades 2-3

Duration/Length:

4 days (60 minutes each day)

Student Outcomes:

Students will:

- **Collect data by conducting surveys**
- **Organize and display data to make tables using a variety of categories and sets of data**
- **Organize and display data to make single bar graphs using a variety of categories and intervals**
- **Interpret data contained in single bar graphs using a variety of categories and intervals**

Materials and Resources:

Lesson 1

- **Teacher Resources 1, 2 & 3**
- **Student Resources 1 & 2**
- **Cheerios- 3 types (Strawberry Yogurt, Apple-Cinnamon, Plain)**
- **Post-It Notes**

- **Baggies for Cheerios**
- **Transparency of Teacher Resource Sheet 1**

Lesson 2

- **Teacher Resources 1, 2, 4, & 5**
- **Student Resources 3 & 4**
- **Baggies for Teddy Grams**
- **Teddy Grams- 3 types (chocolate, chocolate chip, honey)**
- **Graph Paper**
- **Masking Tape**
- **Index Cards**
- **Cooperative Job Cards/Badges**

Lesson 3

- **Teacher Resources 1, 2, 6 & 7**
- **Student Resources 5 & 6**
- **Completed cooperative groups graph**
- **Construction Paper**
- **Glue**
- **Baggies of Cheerios (25 in each bag-10 strawberry yogurt, 8 apple-cinnamon, 7 plain)**
- **Transparency of Teacher Resource 6**

Development/Procedures:

Lesson 1

Pre-assessment/Launch-**Why Are Graphs Important?**

- **Distribute folded copies of Student Resources 1 and 2 (half the class should receive Student Resource 1 and the other half will receive Student Resource 2.)**
- **After distributing the folded papers, have the students take a peak at their paper (make sure that they are not looking at other papers).**
- **After everyone has received their resource papers, begin asking questions about the information displayed on the graph (i.e.. What is the least favorite pet? Most favorite? How many more students like dogs vs. cats? How many students like goldfish?)**
- **The students with Student Resource 2 should begin asking for more time to read and interpret data from the paragraph.**
- **Show the class both Student Resource pages so they understand why some students were able to answer the questions so quickly.**

- **Begin student discussion on why graphs are important and how are graphs helpful. (Discussion points should include; display data, find answers in less time, help make comparisons, and show quantities.)**

Teacher Facilitation

- **Key question:** What vocabulary words are used when we talk about graphs? **Use vocabulary from Teacher Resource 1 (make a transparency of Teacher Resource 1).**
- **Discuss the vocabulary words and meanings. Allow students to draw from their experiences as the words are introduced.**
- **Reinforce the graphing vocabulary through the use of kinesthetic movements to show the parts of a bar graph (Teacher Resource 2).**

Student Application

- **Distribute baggies with three different types of Cheerios (strawberry yogurt, apple-cinnamon, and plain) to each student.**
- **Allow time for students to taste-test the Cheerios to decide which one is their favorite.**
- **Distribute a Post-it note to each student.**
- **Draw the x and y-axis on the board but don't label anything.**
- **Call students up to the board by their favorite type and point to a spot on a column where they should place the post-it on the board (have the columns line up for the favorites but don't label the graph).**
- **Now have the students look at the Post-Its on the board. Ask if someone walked into the room, would they be able to gather any information from this display? (Students should say, no.)**
- **Discuss what parts should be placed on the graph so that it is useful to others.**
- **Refer back to the vocabulary found on Teacher Resource 1 (transparency)**
- **Label the parts of the graph made with the Cheerios data on the board (Teacher Resource 3).**

Embedded Assessment

- **Informal observation to determine students' ability to label the Cheerios graph.**

Reteaching/Extension

- **Reteaching-With the assistance of kinesthetic movements (Teacher Resource 2) review the parts of the bar graph and why each part is important.**

- **Extension-Students can explore other topics that can be used to make a bar graph (Favorite Food, Favorite Movie, Favorite Color, etc…) and how graphing would help make the data easier to understand.**

Lesson 2

Pre-Assessment - **What's Your Favorite…?**

- **Review vocabulary and kinesthetic movements (Teacher Resources 1 & 2) from day one.**
- **Include in the discussion previously asked questions (why are graphs important, how are they helpful).**

Launch

- **Distribute baggies with three different types of Teddy Grams (chocolate, chocolate chip, and honey) to each student.**
- **Allow time for students to taste-test the Teddy Grams to decide which one is their favorite.**
- **Using masking tape, create an x and y axis on the floor.**
- **Distribute an index card to each student, have him or her come forward and place his or her index card in the appropriate column on the floor graph.**
- **Keep students around the graph being created on the floor.**
- **Distribute the parts of the graph (Teacher Resource 4).**
- **Allow selected students to place the appropriate graph part in the space provided to complete the graph.**

Teacher Facilitation **(Cooperative Group Techniques should be previously taught and posted in the classroom. Teacher Resource 5 reviews the job titles and responsibilities.)**

- **Assign cooperative groups of four and distribute job responsibility cards/badges for each group member.**
- **Distribute Student Resource 3 for the data collection and Student Resource 4 for displaying data (1 sheet per group).**
- **Explain to students that they will be conducting a survey as a team on a favorite choice, collecting data and then creating a bar graph with the data. Model the process of recording their data on a tally chart.**
- **Remind students that they need one survey idea as a team that should have three choices. Give some examples (Favorite Fruit: apple, orange, pear: Favorite Pizza: pepperoni, cheese, sausage; etc…) Encourage students to choose different ideas.**

Student Application

- **Cooperative groups need to decide on a survey question and set up their data collection sheet (Student Resource 3) (allow 10-15 minutes).**
- **Once data collection sheets are completed have the cooperative teams take a survey of the class; reporters should read the question and choices to the class, recorders are to record tally marks for each vote, facilitators are responsible for making sure that everyone in their group votes.**
- **After collecting the data, the materials manager, with help from the team, should label the parts of the bar graph on Student Resource 4. The recorder then works with the team to display the data correctly on the bar graph.**

Embedded Assessment

- **Cooperative teams will answer the questions at the bottom of Student Resource 3 to show an understanding of the graphing process and the bar graph they created.**

Reteaching/Extension

- **Reteaching-Give additional support by strategically grouping students so that peer support can be given throughout the lesson.**
- **Extension-Have students who show a complete understanding of the concept check other graphs to make sure all parts are included and labeled correctly.**

Lesson 3

Pre-assessment –**Independent Graphing**

- **Reassemble cooperative groups from previous lesson to allow about 10 minutes for groups to finish and review the data and Favorites Graph (Student Resource 3 and 4) they created.**
- **Students should prepare to share data and display graphs (reporters will serve as the speakers for sharing time).**

Launch

- **Have each cooperative group share their graph and the data they collected.**
- **After each group presents, the teacher will read off the questions from Teacher Resource 6 (either on a transparency or chart).**

- **Based on Teacher Resource 6, students will assign a number score by holding up 1, 2 or 3 fingers after each presentation depending on whether or not they had all of the parts of the graph. If a group receives lower than a three, the class should provide suggestions as to what should be done to make the graph a 3.**

Teacher Facilitation

- **Quickly review graphing vocabulary and kinesthetic movements (Teacher Resources 1 and 2) and close discussion on the Favorites Graph (Student Resource 4).**
- **Distribute baggies with three different types of Cheerios (strawberry yogurt, apple-cinnamon, and plain) to each student.**
- **Distribute Student Resource 5 (before distributing glue graph to construction paper so it is more durable).**
- **Explain to the students that they will be collecting data by sorting the different types of Cheerios in the baggie. After sorting and collecting their data, they will need to label all of the parts of the graph and then use their Cheerios to create the bars for their graph, (students will be gluing the Cheerios onto the graph).**

Student Application

- **Students will independently sort and graph data based on given materials.**

Embedded Assessment

- **Informally observe the launch activity to check for understanding of the parts of the graph based on the rubric (Teacher Resource 6).**
- **Collect, assess and apply numerical grade to students' individual graphs.**

Reteaching/Extension

- **Reteaching-Allow for peer tutoring for students that are not understanding the concepts. Review the kinesthetic movements with those students as they are completing the graph to ensure they have all of the parts.**
- **Extension-Provide additional opportunities for students to survey and create bar graphs based on topics of their choice.**

Summative Assessment:

Students will apply their understanding of collecting, organizing, displaying, and interpreting data using a bar graph by completing a brief constructed response

question and four selected response questions. The assessment can be found on Student Resource 6 and is a tool that can be used to assess student understanding of the skills taught during this unit. Answers for the assessment can be found on Teacher Resource 7.

Appendix A: Teacher Resources

- **Teacher Resource 1-Vocabulary**
- **Teacher Resource 2-Kinesthetic Movements**
- **Teacher Resource 3-Parts of the Cheerios Graph**
- **Teacher Resource 4-Parts of the Teddy Gram Graph**
- **Teacher Resource 5-Cooperative Group Jobs**
- **Teacher Resource 6-Bar Graph Rubric**
- **Teacher Resource 7-Answer Key for Summative Assessment**

Appendix B: Student Resources

- **Student Resource 1-Favorite Pet Graph**
- **Student Resource 2-Favorite Pet Paragraph**
- **Student Resource 3-Survey Form**
- **Student Resource 4-Graph Paper (Favorites)**
- **Student Resource 5-Graph Paper (Cheerios)**
- **Student Resource 6-Summative Assessment**

Authors:

Valerie Hawkins
Arlington Elementary
Baltimore City, MD

Jennifer Manoly
Malcolm Elementary School
Charles County, MD

Sherri Welcher-Brown
Freetown Elementary School
Anne Arundel County, MD

Graphing Vocabulary

1. **Table- A form used to display organized information**

2. **Chart- A form used to collect and display data**

3. **Graph- A diagram that shows the relationship of data in an organized form ex: bar graph or pictograph**

4. **Label- A name for the parts of the graph; To name the parts of the graph**

5. **Title- The name of the graph**

6. **Data- Displayed information**

7. **Data Collection- Gathered information to be displayed in a specific form**

8. **Survey- A way to collect data on a particular subject from a small sample**

9. **Bar Graph- Data displayed using vertical bars, labels, title, and equal number intervals**

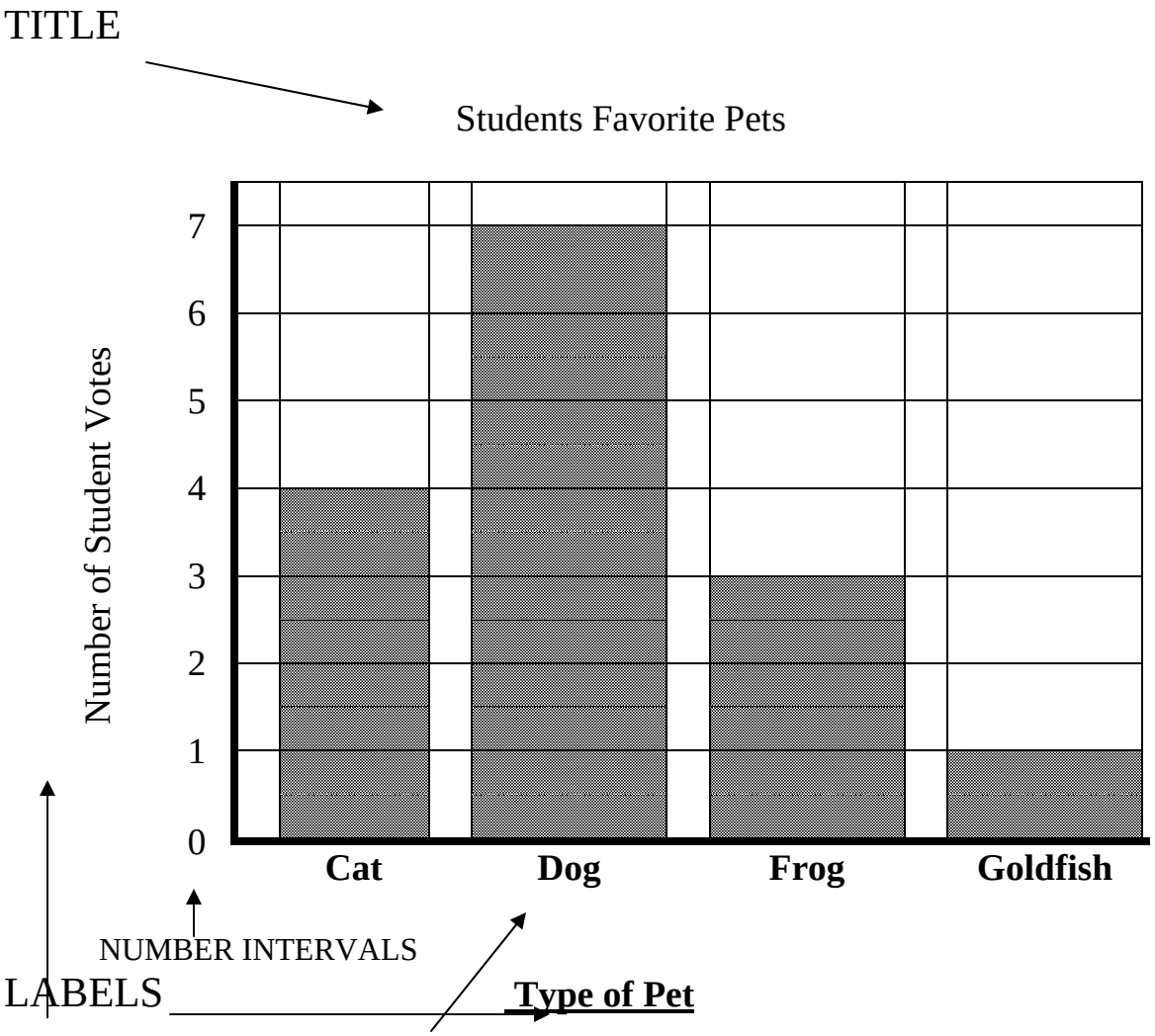
10. **Pictograph- Data displayed using pictures, labels, title, and a key**

11. **Comparing- A way to discover similarities and differences**

12. <u>Equal Number Intervals</u>- A set of numbers used to label the amounts on the graph

13. <u>Tally mark-</u> A line symbol used to record information

14. <u>Tally chart</u>- A form used to collect and display data using tally marks

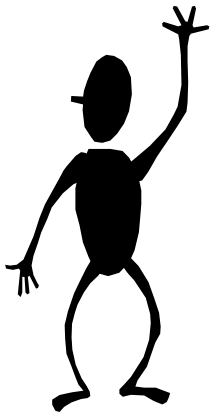


***Shaded bars symbolize collected data**

Teacher Resource 2

Kinesthetic Movements For Parts of a Bar Graph

Kinesthetic movements will give students a movement to match each vocabulary word as a way to help them remember the parts of the graph. First, have the students practice each movement. Then add the vocabulary to go with the movement as they do it, mirroring the teacher. Finally have them partner up and practice the movements with the vocabulary words.



Title-**Draw a line above your head like you are giving yourself a title**

Label-**Pretend to apply a nametag to your shirt like you are labeling yourself**

Zero-**Outline a zero in the air**

Equal Intervals-**Imagine your hands are going up the steps of a ladder**

Bars- **Bring hands straight down to form an imaginary bar in the air**

Labels-**Again apply an imaginary name tag to your shirt (we do this step again to remind students that each bar should be labeled).**

Not Touching- **Fold arms across the body like you are giving yourself a hug to show that the bars should not touch.**

Chant the words: TITLE, LABELS, ZERO, EQUAL INTERVALS, BARS, LABELED, NOT TOUCHING

Parts of a Graph

Directions: Cut the parts of a graph out and paste them on construction paper to make them more durable. Distribute the parts of a graph to randomly selected students. Then ask them to place the missing parts of the graph in the appropriate position on the board.

Our Favorite Cheerio

Number of Student Votes

Types of Cheerio

Strawberry Yogurt

Plain

Apple-Cinnamon

0	**1**	**2**	**3**	**4**	**5**
6	**7**	**8**	**9**	**10**	**11**
12	**13**	**14**	**15**	**16**	**17**

Parts of a Graph

Directions: Cut the parts of a graph out and paste them on construction paper to make them more durable. Distribute the parts of a graph to randomly selected students. Then ask them to place the missing parts of the graph in the appropriate position on the floor.

Our Favorite Teddy Gram

Number of Student Votes

Types of Teddy Gram

Chocolate Chip

Honey

Chocolate

0	1	2	3	4	5
6	7	8	9	10	11
12	13	14	15	16	17

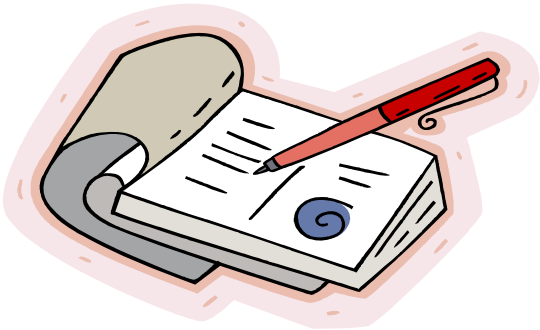
Cooperative Group Jobs and Responsibilities

Facilitator

- Keeps group on task
- Reviews directions and steps for activity

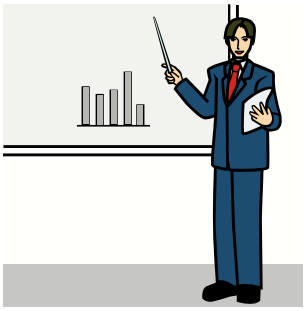
Recorder

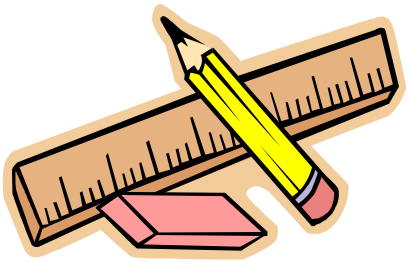
- Records information needed to complete the activity



Reporter

- Shares completed activity
- Serves a group spokesperson





Materials Manager

- Gathers and distributes needed materials
- Collects materials

Bar Graph Rubric

3- **All parts of the graph are included and labeled**

- **X axis**
- **Y axis**
- **Title**
- **Equal number intervals beginning with zero**
- **Quantities correctly represented (in bar form)**

2- **Some parts of the graph are included and labeled**
(One of the following is missing)

- **X axis**
- **Y axis**
- **Title**
- **Equal number intervals beginning with zero**
- **Quantities correctly represented (in bar form)**

1-**Few parts of the graph are included and labeled**
(Two or more of the following is missing)

- **X axis**
- **Y axis**
- **Title**
- **Equal number intervals beginning with zero**
- **Quantities correctly represented (in bar form)**

Summative Assessment Answer Key

1. **b. 6 student**
2. **d. 15 students**
3. **c. 14 students**
4. **d.**

Color	Number of Votes
Orange	**l l l l**
Blue	**l l l l l l**
Red	**l l l**
Yellow	**l**

BCR
Part A - Cookies (1 point)

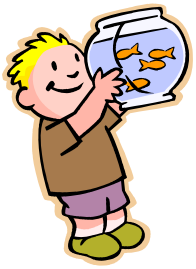
Part B – Answers my vary (0-2 points)

Score of 2 should show a complete understanding of the question and include number support for cookies being the top answer and should compare the number of cookie votes to the other snacks.

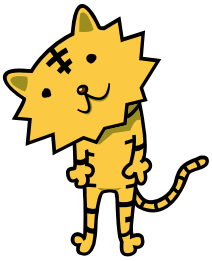
Score of 1 should show some understanding of the questions and include either number support for cookies being the top answer or should compare the number of cookie votes to the other snacks. The answer will not include both quantity and comparisons.

Score of 0 shows little or no understanding of the question.

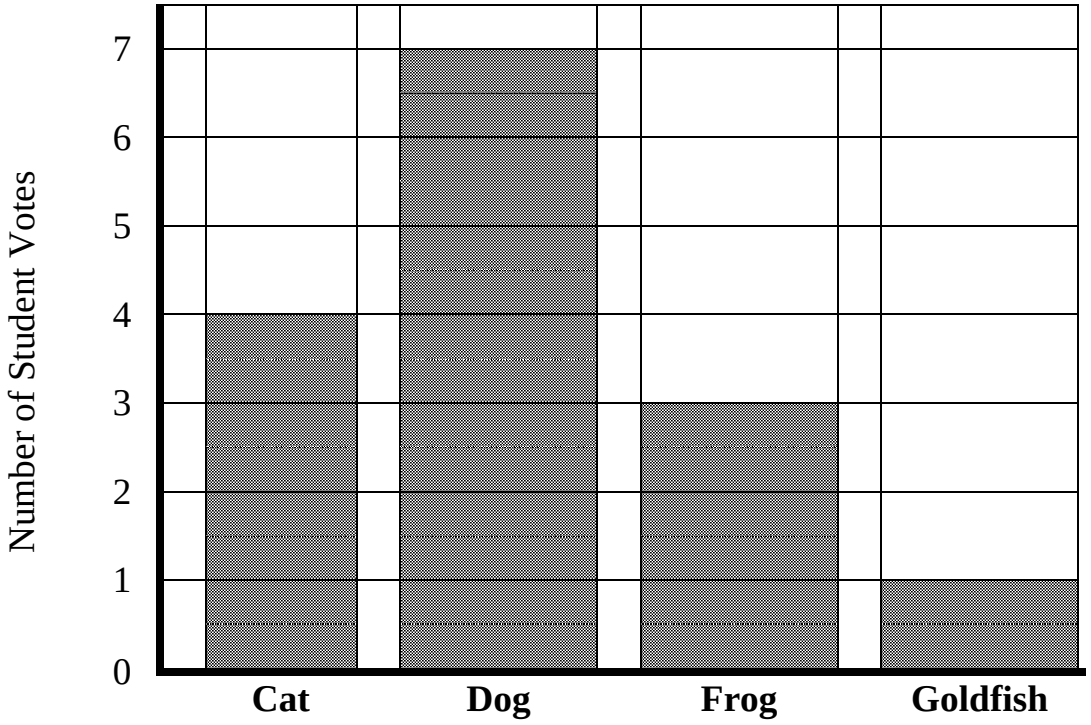
Student Resource 1



What is Your Favorite Pet???

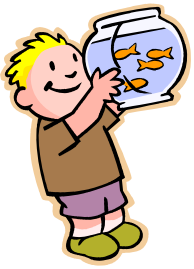


Students Favorite Pets

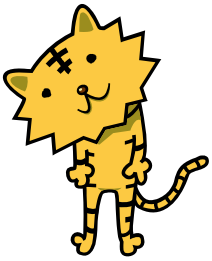


Type of Pet

Student Resource 2



What is Your Favorite Pet???



A teacher surveyed the students in her class to find out their favorite pets. Chris and Tom both love dogs. Sally likes having a cat. Jill and Matt each voted for dogs even though they don't have one. Justus decided goldfish were his favorite. The three students at table four agreed with Sally that cats were the best. Collin convinced Malik and Nathan to all vote for a frog as their favorite. Finally, the last three children from table one voted for dogs as their favorite pets.

Student Resource 3

Survey Form

Name_____

Directions: Conduct a survey with your classmates. Collect the data on the chart below.

Our Favorite _____

Choice 1 _____ Choice 2 _____ Choice 3 _____

Tally Chart

Directions: After you have successfully collected and recorded your data, make a bar graph. Make sure you label the important parts of the graph.

Survey Questions

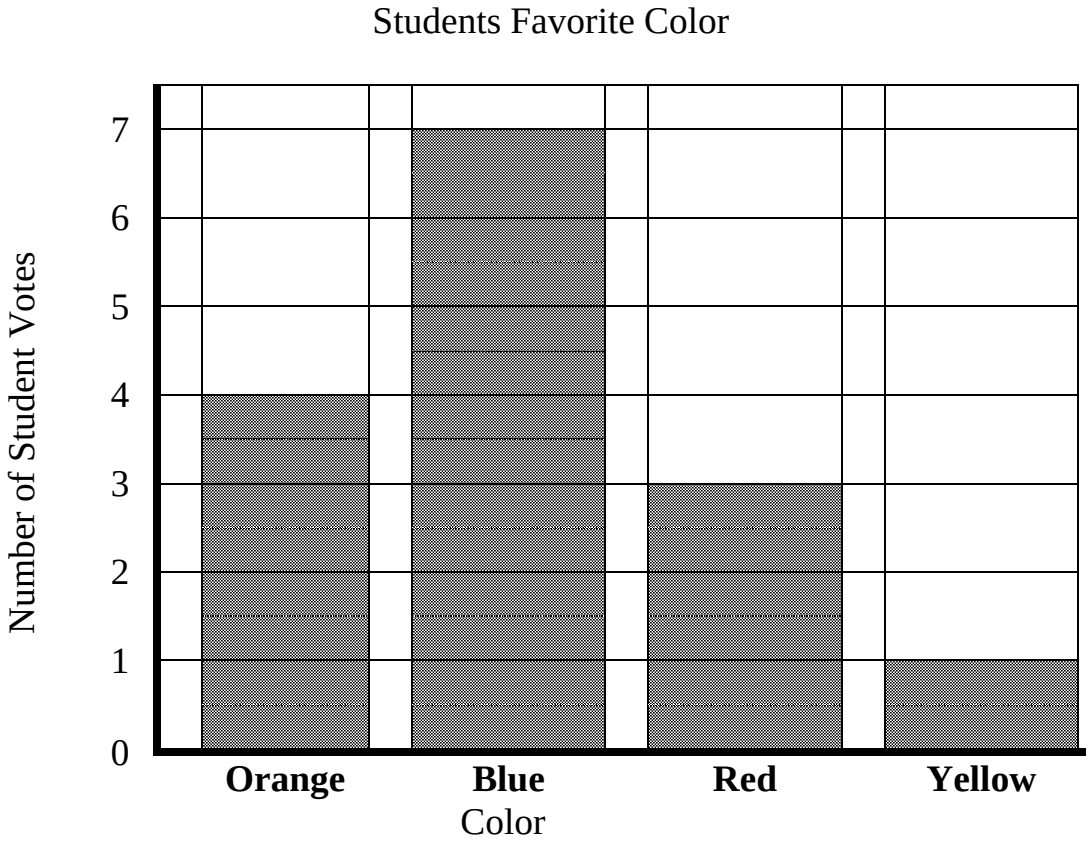
1. **Which item does your classmates like the best?**
   _____
   _____
   _____
2. **What did you learn from this activity?**
   _____
   _____
   _____
   _____
3. **Name the parts of a graph.**
   _____
   _____
   _____
   _____
   _____

Student Resource 4

Student Resource 5

Bar Graph Assessment

Use the following graph to answer questions 1-4.



1. **How many more students voted for blue than yellow?**
    a. **7 students**
    b. **6 students**
    c. **15 students**
    d. **8 students**
2. **How many** total **students were surveyed?**
    a. **25 students**
    b. **0 students**
    c. **7 students**
    d. **15 students**

3. **How many students liked blue, red and orange?**

a. **10 students**
b. **11 students**
c. **14 students**
d. **15 students**

4. Which tally chart shows the data displayed in the bar graph?

a.

Color	Number of Votes
Orange	**𝍸 I**
Blue	**𝍸 𝍸 II**
Red	**II**
Yellow	**II**

b.

Color	Number of Votes
Orange	**𝍸 I**
Blue	**III**
Red	**II**
Yellow	**III**

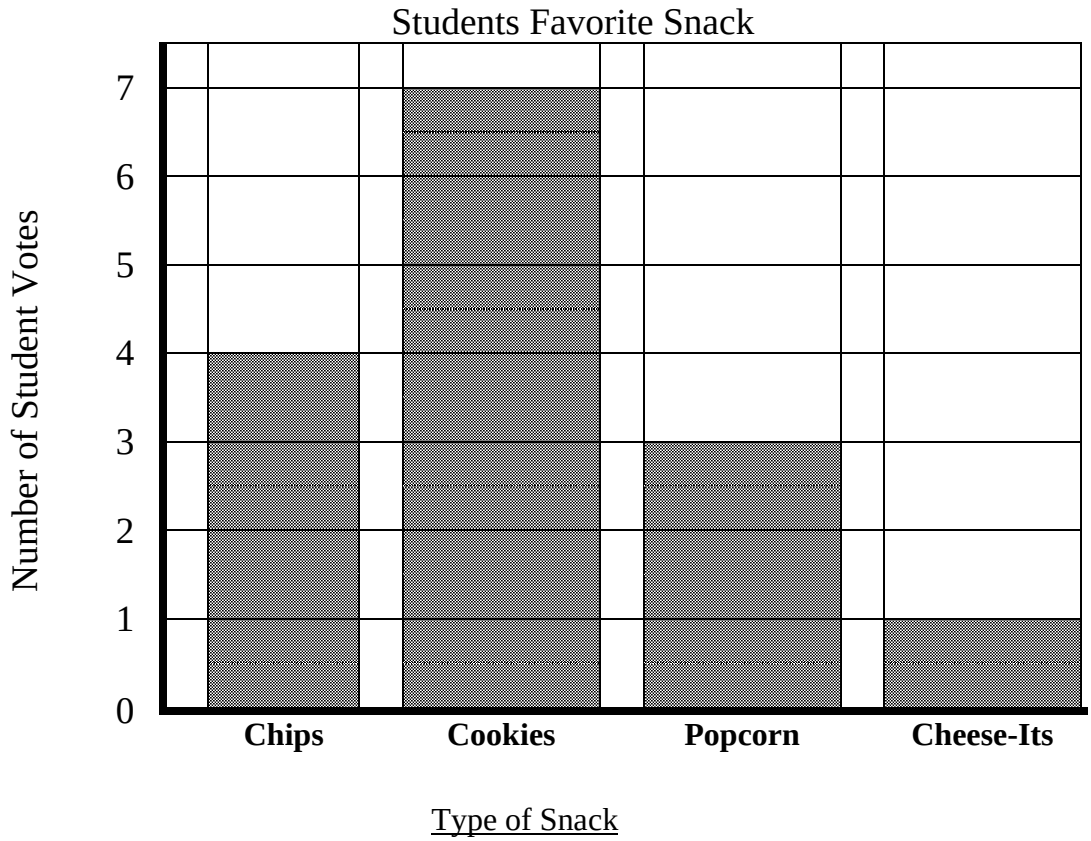
c.

Color	Number of Votes
Orange	**𝍸 I**
Blue	**𝍸 𝍸 𝍸 I**
Red	**III**
Yellow	**I**

d.

Color	Number of Votes
Orange	**𝍸 I**
Blue	**𝍸 𝍸 II**
Red	**III**
Yellow	**I**

Mrs. Davis wants to give her students a treat for their hard work. She wants to know which snack she should purchase for the students to enjoy. She analyzed the data displayed on the bar graph below.



Part A- **Look at the data she collected. What food is most popular among Mrs. Davis' class? _____**

Part B- **Using what you know about bar graphs, explain to Mrs. Davis which type of snack she needs to purchase. Be sure to include math vocabulary and numbers in your response. In addition, justify your answer by using collected data.**